



*Safe and Secure System  
for  
Improved Plant Performance*

# MACHINERY PROTECTION SYSTEM

**MPS 3000 Series**



# ECIL integrated solution for Machinery Protection

ECIL now offers a total integrated solution to all Machinery Protection requirements of the industry with its own Machinery Protection System (MPS). This State-of-the-art DSP based system has been designed in collaboration with BARC, Mumbai and offers advanced features needed for the Protection of different types of rotating machinery and has been fully designed as per the widely followed industry standard API 670. ECIL is in a unique position to satisfy all the machinery protection and monitoring requirements and offers the following advantages.

## Experience

ECIL has the experience of manufacturing and installing transducers of various types in large numbers at industries and power plants. It also supplies, installs and maintains machinery protection systems of every major manufacturer in large number of power plants in India.

## Compliance to Standards

The MPS is designed to fully comply with the American Petroleum Institute's Standard API 670,

## Applications

The features of MPS allow it to be applied to a wide range of rotating machinery in many industries. Some of the more common applications that can be easily addressed by MPS are

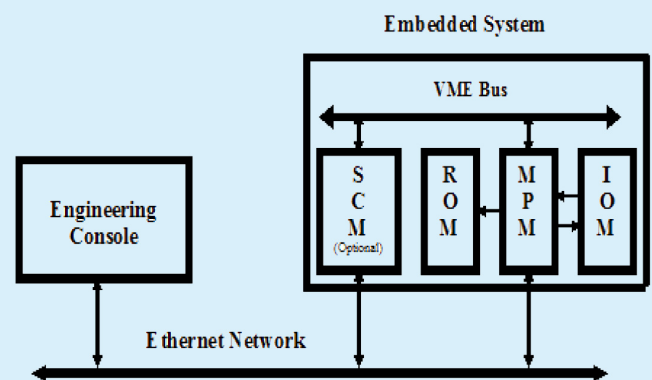
- Steam turbines
- Hydraulic turbines
- Industrial gas turbines
- Reciprocating compressors
- Centrifugal compressors
- Horizontal and vertical centrifugal pumps
- Reciprocating pumps
- Electric motors
- Generators

# System Hardware

The system hardware is modular and scalable and consists of various modules performing signal conditioning, data acquisition, signal processing and protection functions. These modules are fabricated as standard 6U cards sitting on VME bus back plane.

Various modules of the system include:

- DSP based Machinery Protection Module (MPM) for data acquisition, signal processing and protection logic processing.
- Input Output Module (IOM)
  - \* For signal conditioning of input and output signals and to provide interface and power supply to various types of sensors.
- Relay Output Module (ROM)-provides potential free Electromagnetic relay contact for protection.
- System Controller Module-SCM (optional) acts as interface between the embedded system and the engineering console to provide user configurability, data monitoring & analysis and system diagnostics
- Engineering Console
  - \* Contains GUI - Graphic User Interface
- Dual Redundant Power Supply
  - \* Input : 200-250V AC 50Hz 350W
  - \* Output : +5V, +/- 15V, +24V DC



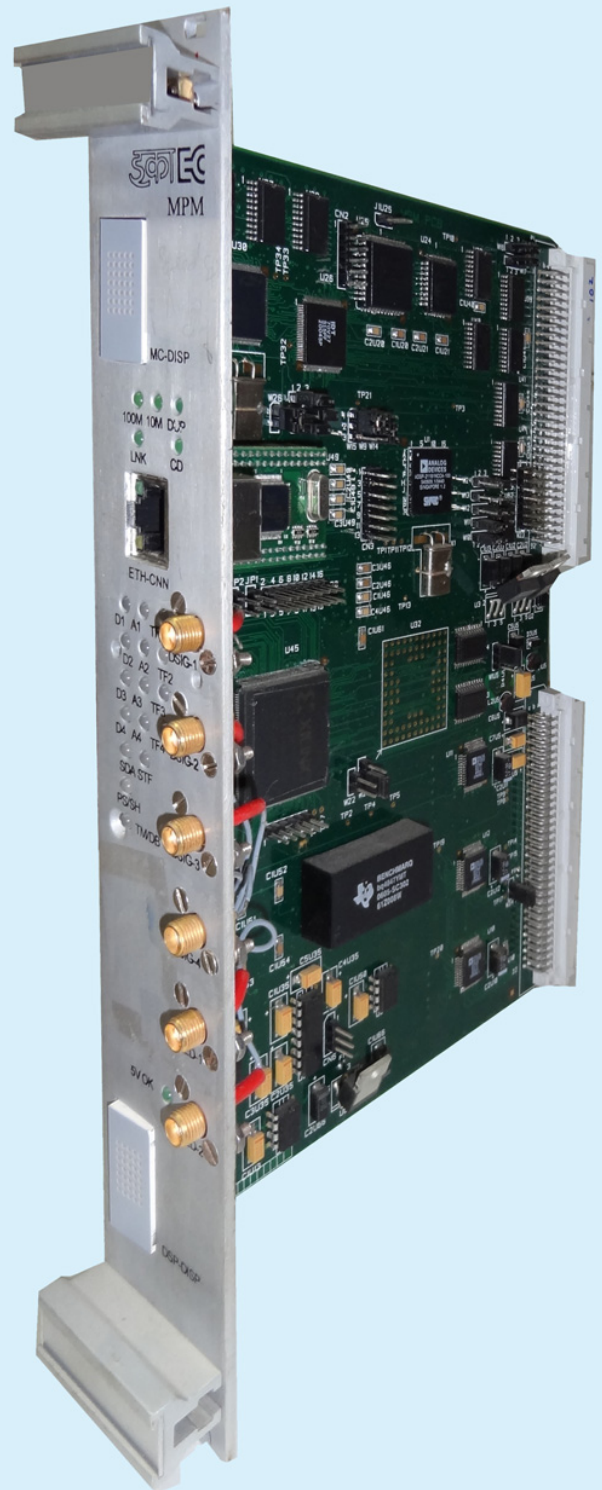
Functional Block Diagram of MPS



# Machinery Protection Module(MPM) Model No: MM 0812

The DSP-based Machinery Protection module is the primary module catering to the acquisition, processing and protection functions of the system. It has the following features and specifications:

- 4 dynamic (vibration) channels and 2 speed channels.
- High speed data acquisition for signals from DC to 3.5 KHz
- Real time measurement and protection using DSP techniques.
- Performs following signal processing and monitoring functions
  - \* Digital filtering (FIR filters) with configurable filter parameters
  - \* Integration & Rectification (RMS,peak-to-peak).
  - \* Signal parameter monitoring and Alarm generation with configurable time delay and hysteresis
  - \* Dual channel processing to measure inputs from two sensors in split range mode
  - \* Signal validation and sensor healthiness checking
- Provision of Danger bypass and Trip multiply functions
- Periodic self health checking and on-demand channel health check using test inputs.
- LED indications and potential free relay contact outputs for the following unhealthy conditions
  - \* Any dynamic signal crossing alarm/trip threshold
  - \* Any sensor failure
  - \* MPM board failure
  - \* Power Supply failure
- On-board Ethernet interface and RS-232 interface
- Raw buffered input signals available on front facia with SMA connectors for ease of analysis
- Hot swappable
- Interface to System Controller Module over VME bus (optional)



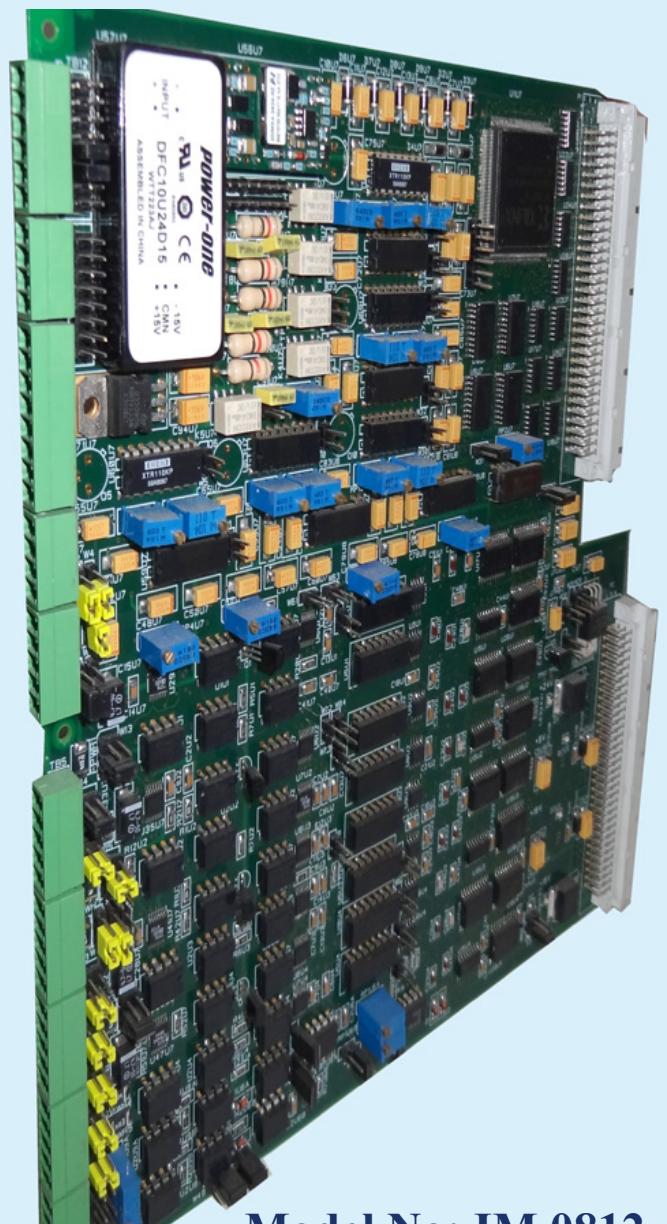
**Model No: MM 0812**

# Input Output Module(IOM)

## Model No: IM 0812

The Input Output Module (IOM) forms the I/O interface and provides signal conditioning for various sensors and interfaces with MPM board. It has the following features and specifications:

- Can be interfaced with 4 dynamic (vibration) sensors and 2 speed sensors.
- Provides Built-in Sensor power supply to various types of sensors.
- Sensor signal to be processed is selectable from a dynamic signal bus.
- Input range: - 18V to + 18V
- Signal conditioning features include Programmable gain and Programmable Supply Voltage to Sensors.
- Sensor failure detection
- Provision to test each channel through reference input.
- Raw buffered input signals available on facia.
- Output: 0 -5V /4-20mA (selectable) and pulsed output for speed
- Generates open collector outputs for driving relays of Relay Output Module (ROM) on alarm conditions.
- Hot swappable
- Flexible terminal strip connections for connecting signal and power cables
- Field sensor interfacing is possible from any IOM to any MPM not Hot swappable.



**Model No: IM 0812**

# Relay Output Module (ROM)

## Model No: RM 0812

Relay Output Module provides relay outputs for alert, danger alarms, transducer faulty alarm etc. It has the following features and specifications:

- a) Drives 16 on-board relays through open-collector signals from IOM based on alarm generated by MPM.
- b) Alarm Signals can be dynamically assigned to any relay of ROM.
- c) Flexible terminal strip for relay connections.



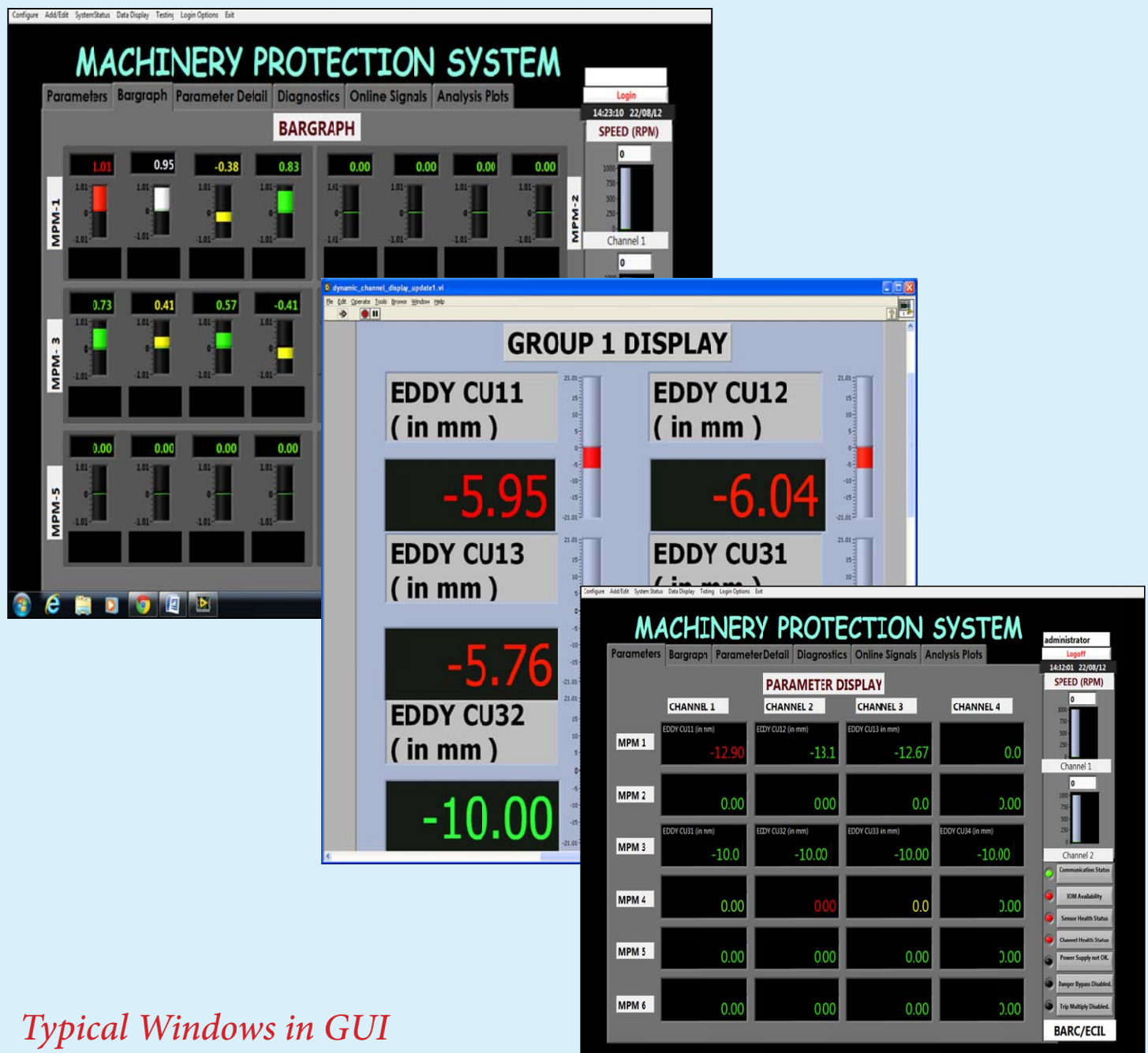
**Model No: RM 0812**



# PC based Engineering Console (EC) cum Display Station

The EC is used for configuring the MPS. It is also used as a display station to display the data received from MPS in different formats like tabular, bar graph etc. to help in diagnosis. The PC based console provides the following configuration and display functions. BasicMonitoring functions

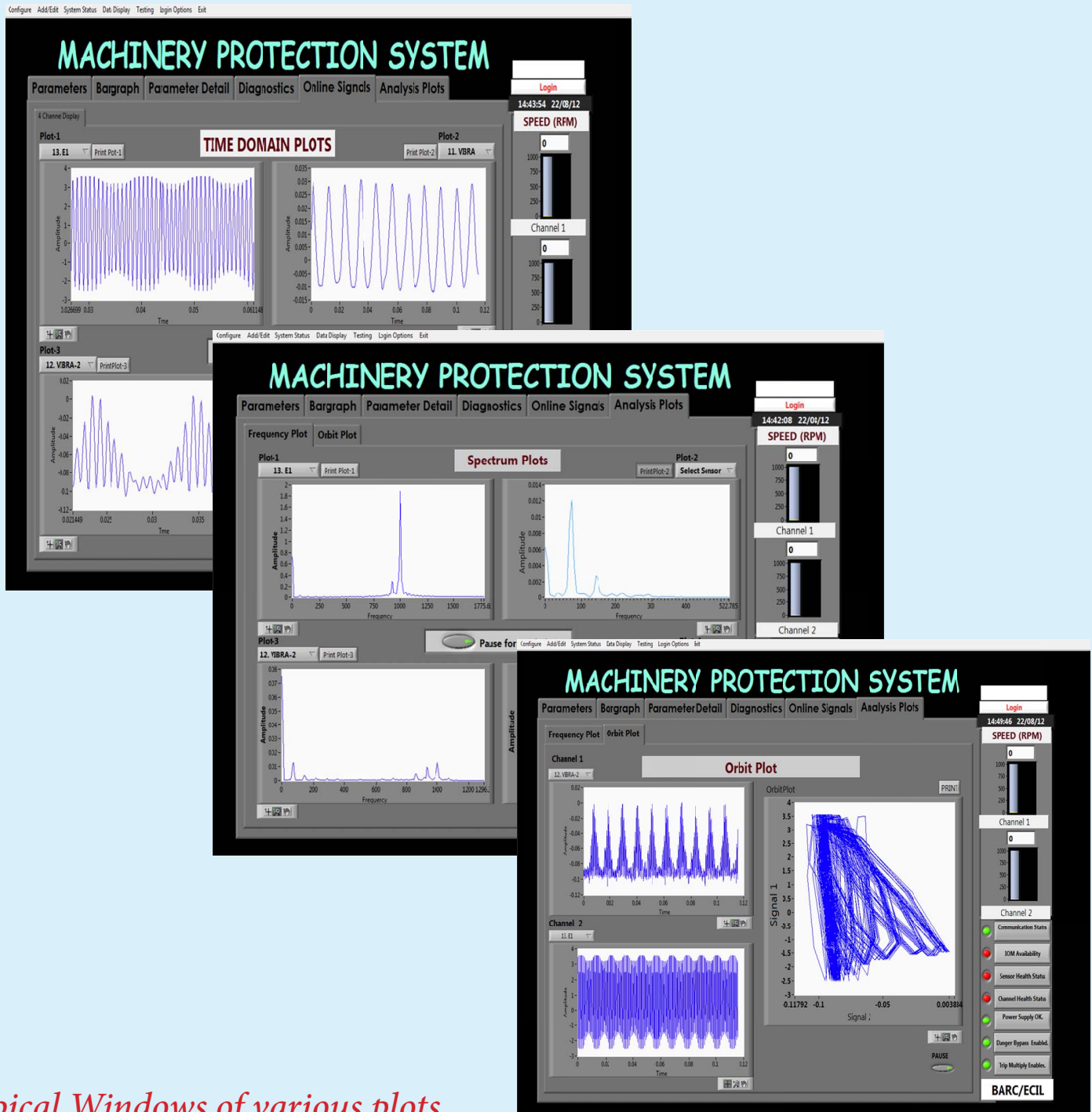
- Real time display of signal parameters (RMS and peak values) in bar-graph and tabular format with data update rate of 1second.
- Colour coded visual indication of signal parameter crossing alarm/danger limits along with messages.
- Long term real-time trend display of RMS values.



*Typical Windows in GUI*

# Display Features & Miscellaneous functions

- Viewing of real time trend, real time spectrum and orbit plot.
- Creates data files of channels for further analysis.
- Display status/indication of Communication link, Sensor OK/Faulty/Open/Short and MPM health.
- Viewing, logging and time stamping of diagnostics messages.
- Printing of signal plots, diagnostic messages and parameter change log and history.
- Display of Channel Input, Output details for debugging.



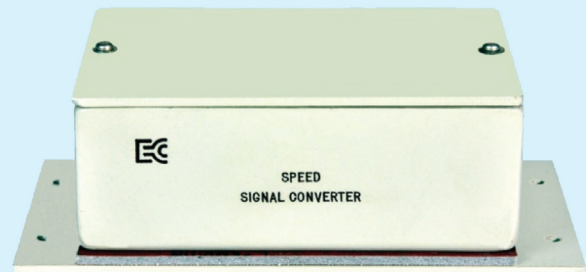
*Typical Windows of various plots*

# FIELD SENSORS for ECMPS

## SPEED SENSOR AND CONVERTER

WORKS WITH EDDY CURRENT PRINCIPLE AND THE SENSOR IS OF NON - CONTACT TYPE.

OPERATING DIST : 0.5 TO 2.5 mm  
NORMAL GAP : 1.5mm  
POWER SUPPLY : +15VDC, 40 mA  
OPERATING TEMPERATURE:  
PROBE : 0-155 deg C  
CONVERTER : 0-70 deg C



## ECCENTRICITY / DISPLACEMENT SENSOR AND CONVERTER

WORKS WITH EDDY CURRENT PRINCIPLE AND THE SENSOR IS OF NON - CONTACT TYPE.

OPERATING DIST : 0.5 TO 2.5 mm LINEAR RANGE: 0.5 TO 2.5 mm  
SENSITIVITY : 8V/mm  
POWER SUPPLY : -24VDC+/-5%, 40 mA  
OPERATING TEMPERATURE:  
PROBE : 0-180 deg C  
CONVERTER : 0-70 deg C



## SENSOR FOR POSITION MEASUREMENT

POTENTIOMETRIC DETECTOR



OPERATING RANGE : 0 TO 40 / 50 mm  
POWER SUPPLY : -15VDC+/-5%, 15mA  
SIGNAL RANGE : -1 TO -9V DC  
OPERATING TEMPERATURE : 0-125 deg C

## SENSOR FOR VIBRATION MEASUREMENT

SEISMIC VELOCITY PICKUP  
FREQUENCY RANGE : 6-1000Hz  
DISPLACEMENT AMPLITUDE : 0-500 MICRONS  
SENSITIVITY : 230mV/100 MICRONS  
OPERATING TEMPERATURE : -25 TO 125 deg C







# इका EC

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